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THE ADJUSTMENT OF CROP STATISTICS.

THE publication of the reports of the twelfth census has furnished a useful corrective to many theories and has put to rout a good many false ideas which have been widely entertained. In no department of the census, however, has this result been more definitely produced than in the matter of crop statistics. It is not strange that the work of the Census Bureau regarding agricultural statistics should be of such pre-eminent importance. There is perhaps no subject of more direct commercial interest than that of such statistics and the estimates based thereupon. How commanding a place is assigned to them by practical men of affairs may be readily seen from the consideration they receive at the hands of boards of trade and commercial bodies of every description. Nor is this work performed by private hands alone during the intervals between census years. In the Department of Agriculture at Washington there has been developed an elaborate mechanism designed to furnish the commercial world with estimates concerning the condition of crops during the growing season, which can be checked by more accurate returns gathered at the end of the crop year. In many states there are state agencies for the performance of the same work. But the result of all this effort has been disappointing. As the

crop statistics of the country have gone on developing, confusion has arisen. It was to be expected that the work of private estimators would be colored by their own pecuniary interest or hampered by inadequate means, or would be fragmentary. In the individual states, local prejudices and lack of means for the support of an elaborate statistical agency would naturally produce some unfortunate results. Until recently, however, it had been supposed that the returns of the Department of Agriculture at Washington were based upon a distinct system carried out by reliable machinery, and yielding returns in which a very considerable degree of confidence could justly be reposed.

Of late several things have occurred to weaken confidence in the work of the Department of Agriculture. Business interests, particularly in New York, have felt that its reports of crop conditions were unsatisfactory. There has been dissatisfaction with the way in which the reports have been brought out and the time at which they have been published. It has been felt too, either that the system employed in the Department of Agriculture was antiquated and unreliable, or else that the management of the statistical work of the department was such as could not be depended upon. But the most severe shock received by the department in popular confidence has resulted from the wide discrepancies noted since the publication of the returns of the census office, concerning agricultural products early in the year 1902. All these factors have had their part in stimulating the uneasiness existing in official circles at Washington for a long time past, and suggesting the wisdom of a change in the statistical work done by the government. Investigation has shown many flaws, extravagances, and duplications in this work, and it has been felt that not only in the interest of economy, but also in that of harmony between different bureaus and harmony in returns, it might be well to reorganize our crop service in a thoroughgoing way.

In the following discussion it is proposed to suggest:

1. The facts of the present statistical discrepancy between the Census Bureau and the Agricultural Department.

2. The merits of the different sets of crop statistics now issued by the government.

3. The history of the controversy which has been raging between partisans of the two different departments during the year 1902.

4. The condition of the statistical service in agricultural matters and the demand for reorganization.

First and most important, it will be desirable to consider the agricultural information published by the Department of Agriculture and by the Census Bureau, and to study the relations of the two offices.

I.

At the present time the Department of Agriculture publishes crop reports through two distinct agencies — the Weather Bureau and the Division of Statistics. The report of the Weather Bureau is published during certain parts of the year monthly, and during other portions weekly, and is designed to show in a general way the effect of weather conditions upon the state of crops in the various sections where the process of growth is in progress. These reports are, of course, never specific, and can be merely the result of the guesses or impressions of a large number of men as to the probable extent of benefit or damage inflicted by good or bad weather conditions as the case may be. As an example of the kind of work done by the Weather Bureau the following may be cited :

> September 23. This week was unseasonably cool in nearly all districts east of the Rocky Mountains, with light to heavy frost, more or less damaging, throughout the central valleys, middle Atlantic states and northern portions of the central Gulf states. Excessively heavy and damaging rains occurred in the east Gulf and south Atlantic states. On the Pacific coast the weather conditions were very favorable, except in northern and portions of central California, where rain caused damage to grain, hay, and grapes. Late corn was damaged to some extent by heavy frosts in North Dakota and portions of Nebraska, Kansas, Missouri, and Iowa.

From such extracts as this it will be readily seen that no scientific value whatever can be accorded to the crop reports of the Weather Bureau. They are at best no more than useful

hints to men engaged in trading corn, wheat, and other farm products. As to how far the returns of the bureau are comparable for one section as against another may be gathered from the following (supposititious but representative) examples:

Alabama.—Cotton is showing the bad effects of the drought and there is a hot wind blowing.

Texas.—Signs are multiplying that boll weevil has injured more cotton than was supposed.

Tennessee.—The bad conditions prevailing during the past few weeks are now intensified, and the outlook for a good cotton crop is discouraging.

Evidently, if one desired to obtain an accurate knowledge of crop conditions from such returns as these, he could do so only by possessing, in the first place, general knowledge of the conditions governing the particular crop in which he was interested throughout the different sections where that crop might be growing. He would also be compelled to go through some mental process whereby these conditions were translated into a percentage estimate, however vague, concerning the extent of damage done by unfavorable weather.

Turning now to the Division of Statistics in the Department of Agriculture, it appears that in general two kinds of returns may be recognized among its figures.

1. In certain crops (hops, flaxseed, sugar, and rice) the Division of Statistics lacks a basis in acreage and so, being unable to furnish figures by its own methods, takes them from the best accessible publications. In the same way, also, are made up all tables of commercial prices as well as tables of "visible supply" of grains and those of freight movements. The tables furnished by railways afford the source from which transportation rates are drawn, while the summaries of the Treasury Bureau of Statistics furnish the material for the figures concerning imports and exports of produce. Tables for the world's production of various staples are taken from the official (or, in default of these, from the commercial) estimates of the countries to which they relate.

2. The only results for which the Division of Statistics is

primarily responsible are those which are based on the returns of its correspondents, and cover cereals, live stock, cotton, etc. Formerly there were some two or three thousand of these, one for each county, but their number has largely increased within recent years, and all told is now reckoned by some at two hundred and fifty thousand.

Each of these correspondents supposedly looks over the area to which he has been assigned and forms a mental estimate of the relations existings between a hypothetical normal crop and the forthcoming crop, the former being regarded as the base. The forthcoming crop is then expressed in terms of the normal by a percentage method. These correspondents number, as has been said, perhaps two hundred and fifty thousand. They are, at the present time, divided into three classes — one for states, one for counties, and one for smaller districts subordinate to counties. These three classes of correspondents are entirely independent one of the other, and report in every case directly to the Division of Statistics in the Department of Agriculture. Thus the division has at the end of each report period three sets of data upon any one of which it may base opinions regarding the condition of crops throughout the country. It is proper to add that of these correspondents, only those representing states are paid by the department.

When there are several returns from correspondents for a county, the usage is to convert the figures into an adopted county return by taking a simple mean; but the county figures are combined into state averages by applying the proper weights. These are furnished in all cases by the last decennial census; thus, if the census figures show three counties to have produced 7,000, 3,000, and 15,000 bushels of wheat, respectively, and each furnishes a figure for condition of the growing wheat crop, or for price per bushel of the harvested grain, or for percentage of the last harvest remaining at a certain date in the farmers' hands, the three figures have weights in determining the state average condition, or price, or percentage, relatively as 7, 3, and 15. Similarly, census reports of area are used in weighting county figures for percentage of area as compared with last year, and

for yield per acre all through the ensuing decade. State averages are built up into general averages for the county by the use of weights, also; but in this case it is not necessary to depend upon a census which may be seven or nine years out of date, because the recent figures of the division itself are for this purpose available. When the present crop is unknown, as in calculation of condition of growing grain, the reported crop of the preceding year is taken as a basis.

The three quantities on which the report of the crop depends are: (1) the area in acres; (2) the average yield per acre; (3) the average price per bushel. Correspondents are also asked to estimate the total product as compared with that of the preceding year, as a check; but little practical use is made of this. Areas can be determined comparatively only, in the absence of a regular farm-to-farm visit by a paid agent. The basis employed is the acreage of the preceding year, of which the present acreage is expressed as a percentage. An average percentage having been found for a state, by census county areas as just explained, that percentage is applied to the state acreage reported for the preceding year, and the present year's acreage thus inferred. For example, if the state shows a weighted mean percentage of 103, this year's area is found by adding 3 per cent. to last year's. This year's area, thus determined, becomes in like manner the basis for calculating next year's, and so on, while the new census furnishes an improved basis. Any error that enters into the deduction of any acreage, from that of the year preceding, must affect, not only that year's figures, but the next, and all thereafter till the end of the decade. There is no tendency in such errors to cancel one another out, as where like quantities are added and accidental differences are neutralized by the law of averages; and unfortunately the defects of an estimate of area by percentage are shown by frequent experience to be of an accumulating nature, so that a divergence from the fact tends to become aggravated rather than corrected. Comparison of the last census figures of acreage and product of wheat, for some of the far southern as well as New England states, with those of the Agricultural Department for the same crops, will show several instances of this.

Besides the three quantities named, several others are ascertained by the Division of Statistics. Amount of grain in farmers' hands on the 1st of March, and again at the end of the crop season, reported as a percentage of the total crop harvested; proportions consumed in the county where grown, and proportion shipped out, reported also in percentage; general quality, and weight per bushel; all these figures are brought out in returns from correspondents, made at suitable times. The crops on which annual reports of area, product, and value are made are the six cereals (corn, wheat, oats, barley, rye, and buckwheat); also potatoes and hay. Figures for condition, during the growing season, cover many other crops, for which final estimates are, for reasons already sufficiently given, impossible. An attempt was formerly made, year after year, to calculate the tobacco crop; but the tendency of its acreage figures to run progressively too short was too strong for the department to counteract, and the results became so unsatisfactory that the statistician decided to publish no more of them. The results for annual production of tobacco are therefore not given by states in the *Year-Book*, but appear, for the whole country, in a table based on figures from the Bureau of Internal Revenue.

For determining the acreage, yield, total product, farm price, and total value of cotton, the same methods used for other crops are adopted; and are regularly used by the Department of Agriculture. But, in addition to these methods, others are made possible by certain facts peculiar to that crop; that practically none of it is consumed on the farm where grown; that it must all go into definite and comparatively few channels, where its amounts may be readily and exactly ascertained; that it does not decay and is bulky. It is possible, on these accounts, to ascertain the total amounts at points of shipment, by water and by rail; and then, allowing for duplication, for amounts that cross state boundaries, for amounts taken by mills within the state, and for amounts still held by the growers, to arrive at a more exact result for the production of the several cotton states without depending necessarily on the acreage. Besides the main facts with regard to this crop, the correspondents report others;

as cost of picking, price and disposition of seed, date of planting, condition of growing crop, etc.

The *Year-Book* tables show, by states, numbers, average prices per head, and total values of horses, mules, milch cows, other cattle, sheep, and swine. Numbers of live stock are reported by correspondents in the same form as are crop acreages, as percentages of numbers held the year before. The average values per head are determined by the Division of Statistics after a somewhat complicated fashion ; the correspondents are required to report the average prices of animals at from two to four designated ages, which prices are afterward combined into one for each species by the use of weights based on census data. Besides numbers and values, the division makes an annual report, in the spring, of condition of live stock and percentages of losses from disease and other causes. Average weight of fleeces, and wool-clips by states, are other items reported.

The monthly reports of the Statistical Division also give statements, based in great part on remarks accompanying the returns of correspondents as to weather conditions prevailing, and also insect and other pests, so far as these are of influence. A recent change has taken place in their form, the reports being now embodied in a monthly publication entitled *The Crop Reporter*.

It is, of course, taken for granted that to work such a system as this, there must be a base from which to start. Such a base might conceivably be obtained by the department itself, should it obtain from each of its correspondents an estimate of the acreage and yield of a given crop for a given year. In such a case its subsequent work would be merely estimate based on estimate. This method, however, has never been followed because a better basis has been afforded. At the end of every decennial period the federal government has taken a census of the country, including not only population, but also agriculture. This census has, of course, been a house-to-house and farm-to-farm count, and supposedly shows the exact status of the country as to population, agriculture, and all branches of manufacturing enterprise. The returns thus furnished for agriculture, if compiled with any degree of care, must evidently be better than any estimate from

any number of men short of the whole population of the country, and they have therefore been accepted by the Department of Agriculture as the base from which to work.

There are certain features of the department's statistical process as just described which are worthy of very careful observation.

In the first place, it should be noted that, let the estimates of the division be ever so carefully made, they have a tendency to grow more and more inaccurate with every succeeding year of a ten-year period. Thus, suppose that a certain crop, according to the census taken (say) in the year 1 was 10,000 bushels. Suppose, further, that the Department of Agriculture had accepted 75 as the percentage for the year 2. The estimated absolute production for year 2 would be 7,500 bushels. Grant, however, that the real percentage for year 2 was 80, evidently there would be an error of 5 per cent., or 500 bushels, in the figures stated for year 2. Now, suppose that a percentage of 200 is accepted for year 3, the absolute figure for that year will be 15,000, when (supposing the estimate in the year 3 to be exactly accurate) the figure should have been 16,000. The error has thus grown from 500 to 1,000, and if we suppose that another error has occurred in the year 3, as is inevitably the case, this error may have again been exaggerated. Continuing the process throughout a series of ten years, it becomes obvious that the mistake in the statistics accumulates at compound interest, and may be very large at the close of the period. In case the statistician in control should then decline to accept the fresh census figures, presented at the end of the ten-year period, as a new basis, and should insist upon continuing with his own figures, still based upon the returns of ten years earlier, it is evident that by the end of another ten-year period the figures of the department would be more than ever hopelessly out of joint with facts.

Having thus reviewed the methods employed by the Agricultural Department in connection with its statistics, it is now necessary to survey the process employed by the Census Bureau. At a later point in this paper it will be desirable to take up for careful examination some of the steps of the census process. At

that time the methods by which this process was carried to completion may be more fully discussed, and it will be necessary, also, to criticise the methods of the Agricultural Department, for the purpose of comparative analysis. It seems appropriate, however, to give here a brief summary of the different steps in the census process, even though some features of that process may not now be wholly self-explanatory, and may require further elucidation. It would, of course, be entirely possible to multiply indefinitely the steps of the census work by adopting a more elaborate method of classification. The following, however, are the most important stages:

1. Enumeration. In this process agents of the Census Bureau went through specified districts and gathered information upon schedules prepared for them in the Census Bureau itself.

2. Receiving and counting the schedules (by hand).

3. General examination of the schedules to ascertain if they are *prima facie* correct.

4. Copying of incorrect schedules. These copies are then returned to enumerators, through the supervisors of their districts, for completion.

5. Examination of schedules. In this stage doubtful schedules are marked in order that printed forms may be sent to enumerators or to the farmers themselves to obtain further information. Schedules are also marked for possible rejection, when they appear to be improbable.

6. Withdrawal of evidently defective schedules for special investigation, and for the sending of special letters concerning them.

7. Listing non-resident owners of farm property who had been marked during the preceding examination. Schedules are then examined in order to eliminate duplicates.

8. Transmission of formal letters to occupants of farms for reply as to their relations to owners or tenants of land.

9. Copying the data furnished in (8) upon the schedules to which they relate, thus correcting the schedules.

10. Editing the crop page (2 of the schedule). This process consists of four parts:

(*a*) A crop editor who is held responsible for everything on the page is supposed to look at the items of acreage, etc., and see that all returns are commensurate.

(*b*) Any additional information received from letters is inserted.

(*c*) Each crop is tested by tables and averages which have been compiled from returns furnished by representative farmers in each district.

(*d*) Other crops (non-cereal) are tested in the same way.

11. Editing the garden page.

12. Editing the live-stock page. At this stage in the process a printed memorandum is affixed to the schedule by the use of a rubber stamp. This memorandum shows the size, character, and total product and net profit of the farm.

13. The schedules are assorted by race and tenure of the farmer and are numbered with the numbering machine.

14. Punching the "farm" and "crop" cards, one of the former and a number of the latter for each schedule. The "farm card" represents the principle facts concerning the acreage and value of the farm and its products, etc., and the "crop card," the date of the schedule relating to crops and animals. All the crops and animals are represented on these cards symbolically by figures.

15. Sorting the cards; first, according to county, and then according to crop. At this stage the accuracy of the punching was tested by a process known as needling.

16. Tabulation of cards by counties and by symbols.

17. Computation of averages for crop yield and value. These averages are based upon the data found on the "result slips" upon which the results of tabulation are recorded.

18. Comparison of results as previously recorded with the figures of the Department of Agriculture and with averages. In addition there is also a comparison of the averages as described in 17 for the several counties in a given state.

19. Examination of the punched cards by thorough and complete needling.

20. Correction of erroneous cards.

21. Review of corrected results for counties, and resurvey of adjoining counties in order to make comparison of figures.

22. Introduction of any additional corrections and consolidation of county returns into grand total for each state.

23. Sorting the cards into groups of thirteen or more counties, according to race and tenure. These groups of county schedules are then once more run through tabulating machines and the results compared with those obtained from the earlier tabulation and harmonized.

24. Preparation of the figures in various forms and combinations for final tabulation.

We may mention as sources of agricultural information, in addition to the statistical agencies already described, three others. Of the state divisions of agricultural statistics and of state censuses of agriculture, so far as they exist, it is unnecessary to speak. The returns they furnish are made up, as a rule, after methods copied from those of the two agencies already discussed. In most cases such returns are unreliable in character and deserve far less credence than those of the agencies of the federal government. Their only superiority to the federal returns lies in the fact that as a rule the conditions to be dealt with are more homogeneous and the men in charge perhaps have a more intimate local knowledge of the region with which they have to deal. These advantages are more than offset by compensating disadvantages. As for the commercial estimates, it would be impossible to speak with definiteness of the methods employed. They are, as a rule, based largely upon the judgment of the statistician in charge, who depends upon returns for commercial movements and who is not bound down to hard and fast methods. Considerable use, of course, is made of the statistics furnished by the government, and in some cases boards of trade have systems of correspondents who supply them with the material upon which to base estimates. Large use is made of returns showing the commercial movement of grains and other products of the farm. Of the reliability of these figures more may be said at a later point. The condition of the information in the hands of students of the subject precludes the possibility of a detailed survey

such as has just been given for the Census Bureau and the Division of Statistics of the Agricultural Department.

From what has been said it will appear that a close, even intimate, relation ought to exist between the Census Bureau and the Division of Statistics. If the Census Bureau furnishes the basis upon which the Agricultural Department makes up its regular estimates, then clearly there should be co-operation, whereby the methods employed in the two departments should be made known to each other, and whereby the basis regularly re-established by the Census Bureau should be as regularly accepted and substituted by the Agricultural Department for the preceding one. Yet, heretofore, this has been only to a limited extent the case. The census has occurred but once in ten years. It has had only a temporary existence, coming to an end so soon as its purpose was fulfilled. The Agricultural Department, with its permanent existence, its regular reports, and its closer relationship to the business interests of the country, has been able to accept, or neglect, or discredit the returns of the Census Bureau substantially as it saw fit. Sometimes it has taken one of these courses, and sometimes another. No real harmony has ever been established between the two bureaus.

As we shall see at another point in this study, the organization of the Census Bureau on a permanent basis has much aggravated the situation just sketched. The natural and logical conclusion has been forced upon many minds that the department which obtains the basis for the regular estimates should also be vested with power to make and issue these estimates, or that the reverse should be the case. Inasmuch as the Census Bureau is the department of the government which does the fundamental work in the matter, and, inasmuch as it is now assured a continued existence, the judgment of the most unprejudiced men has been that the work of the Division of Statistics in the Agricultural Department is obsolescent, and should either be cut off altogether or transferred to the Agricultural Department of the Census Bureau. This idea, of course, is a product of very recent growth, the Census Bureau itself having

been made permanent only in the spring of 1902. It is merely since that time, therefore, that opportunity has been afforded for the discussion of this problem of organization.

Important as it may be, however, to harmonize the results of the two bureaus, and to place both under a united control, the idea would not gain so much force or attract such general and widespread attention were the two offices ready to work harmoniously with one another, and were the Agricultural Department prepared to give full faith and credit to the work of the census office in preparing the basis for its estimates. Neither of these efforts at co-operation, however, has been made. Since the publication of the returns of the Census Bureau there has ensued a period of friction and controversy between the two offices the like of which has never before been known. In part, of course, this period of friction has been a repetition of what has occurred on former occasions, but the fact that the Census Bureau has at other decennial periods gone out of existence as soon as its work was done, while it has this time been retained as a permanency, would, in either event, have given greater prominence to variations in the statistical work like those just referred to. A controversy, which has now lasted the greater part of a year, might have been avoided had the returns of the Census Bureau either agreed in substance with the estimates of the Agricultural Department, or had they, at all events, not differed from the latter more widely than was ever the case with previous censuses. Neither of these conditions has, however, come to pass. Not only has the Census Bureau developed great executive strength under its director, ex-Governor Merriam, but it has shown itself fully able to take care of itself in the political world. Its returns have, moreover, revealed so wide a divergence from those of the Agricultural Department as to indicate that the latter are and perhaps under existing circumstances must necessarily be, so wide of the real facts of the case as to be practically worthless as a guide to traders and speculators. Added to these facts, the situation has been aggravated by the refusal of the statistician in charge at the department to come to terms with the census office and to accept the basis fur-

nished by it for the estimates of the department during the coming ten-year period.

The existing discrepancy in crop statistics between the two offices is of great importance. It is important, first, as throwing light on the methods of the Agricultural Department; second, as showing the need of some system whereby the work of the two may be consolidated and unified; and, third, as indicating the bad conditions prevailing in a government statistical service which permits two departments to cover the same ground and to issue rival sets of statistics from which those who are interested in such subjects must choose. The situation is neither tolerable nor seemly. It is of the highest moment that one of these sets of statistics should be authoritatively discredited. Both cannot be correct. So complicated are the methods, as already set forth, for getting the statistics in question, and so complex are the returns when made, that probably few persons have realized the immensity of the divergence which now exists. What this divergence is in the case of the most important crops; what has thus far been done in the effort to simplify matters; and what action is still demanded, we shall now try to see.

II.

In reviewing the discrepancies between the work of the Census Bureau and that of the Agricultural Department, we shall deal with concrete cases only in so far as is necessary to show the extent and character of the divergence in figures. We shall, therefore, make no effort to compare all the returns of the two bureaus, but shall content ourselves with an impartial selection of representative returns. For cereals we will deal with wheat and corn only. We shall add a discussion of the returns for hay, for live stock, and lastly for cotton and tobacco. These comparisons will sufficiently cover the field, and will enable us to draw authentic inferences as to the methods employed in the two bureaus and the directions in which efforts to harmonize them must be applied.

In the following table the production of wheat for the past

decade, as given by the Agricultural Department after the methods already described, is furnished:

ACREAGE, PRODUCTION, ETC., OF WHEAT FOR THE UNITED STATES, 1890–1901.

Year.	Acreage.	Average Yield per Acre.	Production in Bushels.
1890	36,087,154	11.1	399,262,000
1891	39,916,897	15.3	611,780,000
1892	38,554,430	13.4	515,949.000
1893	34,629,418	11.4	396,131,725
1894	34,882,436	13.2	460,267,416
1895	34,047,332	13.7	467,102.947
1896	34,618,646	12.4	427,684,346
1897	39,465,066	13.4	530,149,168
1898	44,055,278	15.3	675,148,705
1899	44,592,516	12.3	547,303,846
1900	42,495,385	12.3	522,229,505
1901	49,895.514	15.0	748,460,218

It will be observed from the foregoing table that the reported production of wheat in 1899 was but 547,303,846 bushels. It was, therefore, with considerable surprise that the world received early in 1902 a report from the Census Bureau indicating a yield of 658,534,252 bushels for 1899, or, roughly, some 111,000,000 bushels more than what was reported by the Agricultural Department. That a terrible discrepancy had occurred was thus made manifest, and upon closer consideration it appeared that the differences between the two bureaus were not uniform throughout the various states, either absolutely or relatively. Nor was there any correspondence between the discrepancies in different states with regard to acreage, on the one hand, and with regard to production on the other.

In the following table is given a review by states of the acreage, production and value of wheat as reported by the census for 1899.

It will not be necessary to furnish at this point the detailed figures of the Department of Agriculture on this topic. It will suffice to give a summary review of the differences for certain selected returns. Mr. Charles B. Murray, editor of the Cincin-

ACREAGE, PRODUCTION, AND VALUE OF WHEAT, 1899.

States and Territories.	Acres.	Bushels.	Value.
The United States	52,588,574	658,534,252	$369,945,320
North Atlantic division	2,213,587	33,114,070	22,540,965
South Atlantic division	3,368,872	31,902,857	22,903,064
North central division	35,496,201	441,300,918	244,332,729
South central division	5,922,170	61,901,477	35,887,396
Western division	5,587,744	90,314,930	44,281,166
Alabama	123,897	628,775	502,240
Alaska	.....	.....	.....
Arizona	24,377	440,252	276,639
Arkansas	379,453	2,449,970	1,383,916
California	2,683,405	36,534,407	20,179,044
Colorado	294,949	5,587,770	2,809,370
Connecticut	393	8,660	6,080
Delaware	118,740	1,870,570	1,247,055
District of Columbia	17	410	349
Florida	85	800	601
Georgia	319,161	1,765,947	1,547,773
Hawaii	.....	.....	.....
Idaho	266,305	5,340,180	2,131,953
Illinois	1,826,143	19,795,500	11,929,458
Indiana	2,893,293	34,986,280	22,228,916
Indian Territory	247,247	2,203,780	1,121,259
Iowa	1,689,705	22,769,440	11,457,808
Kansas	3,803,818	38,778,450	19,132,455
Kentucky	1,431,027	14,264,500	8,923,760
Louisiana	214	2,345	1,888
Maine	6,667	116,720	107,396
Maryland	634,446	9,671,800	6,484,088
Massachusetts	95	1,750	1,515
Michigan	1,925,769	20,535,140	12,921,925
Minnesota	6,560,707	95,278,660	50,601,948
Mississippi	6,447	37,257	30,743
Missouri	2,056,219	23,072,768	13,520,012
Montana	92,132	1,899,683	1,077,210
Nebraska	2,538,949	24,924,520	11,877,347
Nevada	18,537	450,812	263,471
New Hampshire	271	4,035	3,428
New Jersey	132,571	1,902,590	1,347,650
New Mexico	37,907	603,303	390,616
New York	557,736	10,412,675	7,332,597
North Carolina	746,984	4,342,351	3,463,726
North Dakota	4,451,251	59,888,810	31,733,763
Ohio	3,209,074	50,376,800	32,855,834
Oklahoma	1,279,826	18,124,520	8,989,416
Oregon	873,379	14,508,636	6,358,395
Pennsylvania	1,514,043	20,632,680	13,712,976

ACREAGE, PRODUCTION, AND VALUE OF WHEAT, 1899.—*Continued.*

States and Territories.	Acres.	Bushels.	Value.
Rhode Island	15	310	245
South Carolina	174,245	1,017,319	958,158
South Dakota	3,984,659	41,889,380	20,957,917
Tennessee	1,426,112	11,924,010	7,882,697
Texas	1,027,947	12,266,320	7,051,477
Utah	189,235	3,413,470	1,575,064
Vermont	1,796	34,650	29,078
Virginia	927,266	8,907,510	6,161,000
Washington	1,088,102	21,187,527	9,028,209
West Virginia	447,928	4,326,150	3,040,314
Wisconsin	556,614	9,005,170	5,115,346
Wyoming	19,416	348,890	191,195

nati *Price Current*, has computed the following table of percentages, which were prepared by taking the Department of Agriculture's figures as 100 per cent. and stating the census figures in terms thereof:

	Acreage.	Yield per Acre.
California	112	97
Idaho	187	82
Illinois	144	108
Indiana	112	123
Iowa	121	104
Kentucky	159	109
Minnesota	129	108
Missouri	179	113
Nebraska	126	95
New York	147	101
North Dakota	110	105
Ohio	114	110
Oregon	76	94
South Dakota	112	98
Tennessee	150	95
The entire country	118	102

The discrepancies which thus stand revealed had hardly become known in the late winter of 1901–2, when they at once began to excite intense interest among statisticians and traders in grain, and an earnest demand was made for some

explanation of the variations. The statistician of the Agricultural Department very shortly made known in an unofficial way his determination not to accept the census figures for wheat or for other products, and declined to adjust the statistics of the Department of Agriculture by accepting the census returns as a basis. This refusal was based upon considerations which will be reviewed at a later point. It led to prolonged and general dissatisfaction. Urgent requests for an investigation of the two bureaus (which, as will be seen, resulted in the investigation demanded) were received from all sides. This pressure made it evident to the officials of the Department of Agriculture that they must take some action. They were in an unfortunate position, for the Census Bureau furnished the only basis upon which to correct their figures. Should they reject this, they would be without any source of correction, other than an annual census of agriculture possibly to be instituted by themselves, for ten years to come. It was largely a consideration of such facts, added to the general dissatisfaction, which led to a modification of the figures of the department. Late in the spring of 1902 the task of adjustment was taken in hand, and revised figures were given out by the Department of Agriculture These. figures were not identical with those of the Census Bureau, and it was not announced on what grounds variations had been allowed to persist. The only statement vouchsafed by the department was that the returns of the census had been carefully reviewed and had been accorded "due weight." Just what this "due weight" was could not be officially learned. When the *Year-Book* for 1901 appeared, however (September, 1902), more light was thrown upon the subject. In that volume there was presented the following table, showing the production of wheat by states for the year 1901. It will, of course, be noted by the reader that this was the first *Year-Book* in which modifications based on the census could have been made, since the census figures for 1899 were given to the world only in 1902. In other words, the department, in order to modify its returns for 1901 must have accepted a new basis for 1899, obtained by giving "due weight" to the census figures, and must then have obtained

ACREAGE, PRODUCTION, AND VALUE OF WHEAT IN THE UNITED STATES.

States and Territories.	Crop of 1901.		
	Acreage in Acres.	Production in Bushels.	Value in Dollars.
Maine	7,419	177,314	171,995
Vermont	1,742	32,575	30,620
New York	597,823	7,831,481	6,421,814
New Jersey	122,741	2,062,049	1,484,675
Pennsylvania	1,676,070	28,660,797	20,635,774
Delaware	113,329	2,096,586	1,488,576
Maryland	774,136	13,315,139	9,453,749
Virginia	888,091	9,680,192	7,066,540
North Carolina	777,255	6,762,118	5,544,937
South Carolina	259,160	2,280,608	2,234,996
Georgia	370,996	3,042,167	2,859,637
Alabama	132,788	1,155,256	1,016,625
Mississippi	4,389	38,623	33,216
Texas	681,126	6,062,021	4,728,376
Arkansas	355,325	3,126,860	2,438,951
Tennessee	1,212,441	13,094,363	9,689,829
West Virginia	416,004	4,534,444	3,491,522
Kentucky	959,603	11,611,196	8,360,061
Ohio	2,191,670	33,532,551	23,808,111
Michigan	1,234,499	13,702,939	9,729,087
Indiana	2,021,069	31,932,890	22,353,023
Illinois	1,707,503	30,052,053	20,735,917
Wisconsin	469,920	7,576,874	4,924,968
Minnesota	6,209,506	80,102,627	48,061,576
Iowa	1,295,689	21,048,101	12,628,861
Missouri	1,958,308	31,137,097	21,484,597
Kansas	5,355,638	99,079,304	58,456,789
Nebraska	2,456,543	42,006,885	22,683,718
South Dakota	4,004,830	51,662,307	27,381,023
North Dakota	4,527,532	59,310,669	32,027,761
Montana	88,807	2,353,386	1,576,769
Wyoming	21,027	515,162	355,462
Colorado	312,521	7,531,756	5,046,277
New Mexico	44,295	952,342	685,686
Arizona	26,047	567,825	482,651
Utah	180,433	3,698,876	2,589,213
Nevada	19,450	488,195	429,612
Idaho	294,397	6,241,216	3,807,142
Washington	1,185,793	34,518,968	16,213,915
Oregon	814,742	17,158,065	9,265,355
California	2,672,547	34,743,111	20,845,847
Oklahoma	1,253,583	20,558,761	12,952,019
Indian Territory	198,727	2,424,469	1,672,884
United States	49,895,514	748,460,218	467,350,156

its returns for 1901 by multiplying this revised basis for 1899 by the percentages previously established through the reports of correspondents for 1900 and 1901. From this table and that

given at an earlier point, showing the production of wheat 1890–1901, it appears that the figures of the Department of Agriculture took a sudden bound from 522,229,505 bushels in 1900 to 748,460,218 bushels in 1901 an increase amounting to more than 40 per cent. and showing a much larger yield than could possibly have been justified by the department's earlier returns had they possessed any elements of correctness.

It was, indeed, with great reluctance that the Agricultural Department brought itself to amend its figures in such a way as to conform to the census. To institute an elaborate comparison of the figures would necessitate a lengthy treatment, and would, perhaps, lead to no particular result in discovering any principle upon which the work of harmonizing the two sets of figures had been carried on. In some parts of the country the figures finally reported by the Agricultural Department, after "due weight" had been given to the census process, approached very closely to the figures of the census. In others, considerable variations were still retained. Inquiry at the Department regarding the principles upon which the changes had been made produces, as already intimated, nothing more than a refusal to furnish any information, and leaves the inquirer exactly where he stood before. Evidently, therefore, there is nothing to be learned as to the principles of the adjustment save from analysis or from extraneous information.

As has already been said, the results to be gained from analysis, pure and simple, are not in all cases sufficient to indicate any principle of reconciliation. A review of the figures would seem to show little more than a hit-or-miss increase of the returns throughout the country. About the only thing that can be observed in a general way is, that in some sections the figures have been more uniformly and more extensively raised than they have in others. Yet even this clue is of value. Viewing it in the light of what is known from a study of commercial journals — especially those dealing specifically with the grain trade — it appears certain that what was done by the Agricultural Department was to move its figures in the direction of harmony with those of the census, in such regions and for such

areas only as appeared to demand it, irrespective of the work done by the census enumerators. This may be more thoroughly understood by a brief retrospect.

We have already seen that the figures of the Department of Agriculture for wheat have over a period of years been low, and that, if the census is to be accepted as furnishing a correct guide, this tendency to shortage has been so extreme as to indicate not merely a natural error in estimate, but a thoroughly defective system of computation. The existence of such a defective system was early perceived by the commercial estimators connected with the grain trade. For some parts of the country the means at the disposal of these men are nearly perfect. For example, in Minneapolis and Duluth, the primary wheat markets and centers for the flour-milling trade of the Central and Northwest, it was possible to reckon with some degree of accuracy the probable amount of the wheat product of the Northwest by ascertaining the amount shipped to these two markets and to the local mills of Minnesota and the two Dakotas. Of course, this commercial movement applied only to a relatively limited area. It gave little evidence as to acreage or the location of the acreage. It was possible to determine acreage in a rude way only by ascertaining the average yield per acre, and computing acreage from product. But the number of bushels shipped in to the milling centers, and hence, approximately the amount of the crop for a prescribed section, could be known with great certainty. These estimators informed the Agricultural Department of their belief that its figures for wheat were by far too low. The department, however, quite consistently declined to raise its returns in accordance with the opinions of such estimators. Yet, when the census figures appeared, it was at once seen that they confirmed the estimates of the commercial experts of the grain trade, varying for one of these reports by only 500,000 bushels in a total of approximately 200,000,000 bushels. This was at once pointed out in various journals, and the pressure of public opinion in technical circles was such as practically to compel the Agricultural Department to make alterations in accordance with the ideas of

those most familiar with conditions in different localities. In trying to suit the figures to the ideas of the community, the department probably proceeded on the principle of not conceding anything unless absolutely obliged to do so. In many sections of the country, where no commercial centers for handling grain in the way already described had been perfectly developed, it was known that men depended to a great extent upon the figures of the department. If, therefore, they found these figures substantially correct for average yield—and in the matter of averages they did not materially vary from the figures of the census—they were likely to accept the estimates for acreage and for product. In such regions it was possible for the statistician of the Agricultural Department to affirm the reliability of his own statistics as compared with those of the census. Therefore, by yielding in those sections where commercial estimates appeared to support the census figures, and by accepting the previous estimates of the *Year-Books* as sound in those sections where no distinct opinion prevailed, either among the farmers or local grain dealers, it was probably sought to make an empirical adjustment of the wheat figures of the department to those of the census.

What has been said concerning wheat applies also to other cereals, such as corn, oats, etc. In the case of wheat, however, it is possible to trace the working of the forces of public opinion in compelling statistical changes with more clearness than in the case of a cereal like corn, which is more largely fed to animals and which is far less easily measured in terms of the commercial movement than is wheat. Yet by the aid of traveling correspondents sent into various counties and states, where the largest differences existed between the figures of the respective bureaus, the Agricultural Department effected a partial reconciliation between the two sets of statistics, yielding as before only at those points where opinion seemed most urgently to demand it, and standing stiffly out at others, where it seemed possible to make a successful contest in the absence of well defined public opinion. How dangerous was this process, how fatal to any correctness, as well as to the acceptance of definite

principles in the formulation of crop statistics, need hardly be enlarged upon.

Before leaving the discussion of wheat statistics, it will be worth while to show by one concrete example how the process of reconciliation was carried out in the Northwestern wheat region, to which reference has already been made. To this end, we will confine our attention for the sake of simplicity to the so-called "spring-wheat states."

According to the *Year-Book* for 1899, the following acreage was reported from those states:

State.	Year 1899.
South Dakota	3,526,013
North Dakota	4,043,643
Montana	69,764
Wyoming	21,029
Colorado	309,611
New Mexico	186,946
Arizona	22,362
Utah	180,505
Nevada	38,167
Total	8,398,040
Idaho	142,153

It will be recalled that the so-called "percentages" published regularly by the Department of Agriculture stand merely for the relation between the acreage sown for the current crop period and the acreage actually harvested the preceding year. For the year following the statistics thus given from the *Year-Book*, the statistician reported, in the *Crop Reporter* for June, 1901, the following acreage. By the side of this acreage have been placed percentage figures representing the relation which it was supposed the crop to be harvested in 1900 (judging from acreage sown) would bear to the acreage actually harvested in 1899.

Comparing these figures and the percentages corresponding to them with the columns already given, it appears that, although in South Dakota there was a considerable decrease, instead of the anticipated increase, in North Dakota a much

State.	Year 1900.	Per-centage.
South Dakota	2,920,244	101
North Dakota	2,689,023	95
Montana	72,555	104
Wyoming	20,819	99
Colorado	318,899	103
New Mexico	183,207	98
Arizona	25,045	112
Utah	176,895	98
Nevada	40,457	106
Total	6,447,144	
Idaho	149,261	105

more than anticipated decrease, and some other minor discrepancies, the percentages on the whole are fairly representative of the figures ultimately reported for acreage harvested.

In the following table is given in the first column the acreage reported in the *Crop Reporter* for June, 1902, as having been harvested in 1901; in column two the percentages of acreage sown as compared with acreage harvested for the preceding year; and in the third column the census figures for 1899, which were in the hands of the statistician prior to his making up the figures given in the first column of the subjoined table:

State.	Year 1901.	Per-centage.	Year 1899. (Census).
South Dakota	4,004,830	95	3,984,659
North Dakota	4,527,532	95	4,451,251
Montana	88,807	102	92,132
Wyoming	21,027	101	19,416
Colorado	312,521	98	294,949
New Mexico	44,295	110	37,907
Arizona	26,047	104	24,377
Utah	180,433	102	189,235
Nevada	19,450	107	18,537
Total	9,224,942		9,112,463
Idaho	143,291	102	266,305

It should be observed that, although 1901 was expected to be, judging from acreage sown, only 95 per cent. of the preceding year, it turned out to be 4,004,830 acres, instead of

2,920,244 for South Dakota. In North Dakota more remarkable discrepancies are observable. Although the acreage for 1900 was but 2,689,023, and that for 1901 was expected to be only 95 per cent. of this figure, it turned out to be 4,527,532, or about 75 per cent larger, instead of 5 per cent. smaller, than the acreage for 1900. In a similar way the acreage for New Mexico, which was 183,207 in 1900, was expected to be 110 per cent. of that figure for 1901, but turned out to be only 44,295. In other words, it fell off about 75 per cent. instead of increasing 10 per cent. So in Nevada, the acreage for 1900 was 40,457 and was expected to be 107 per cent. of that figure for 1901, but turned out to be 19,450, falling off more than 50 per cent., instead of increasing 7. Contrasting with the figures furnished by the census for the several states just referred to, it appears that in nearly all cases the correspondence between the census figures in the spring-wheat states and the figures of the Agricultural Department for those of this group of states in which there is such a remarkable variation, correspond closely. Comparing totals for the nine states, it appears that the Agricultural Department's estimate is about 1.2 per cent. larger than the census report.

The most peculiar feature of the whole showing is found in the case of Idaho. It will be seen that in 1899 the acreage was 142,153. The expected acreage for 1900 was 105 per cent. and the actual 149,261, a fairly close correspondence. For 1901 it was expected to be 102 per cent. of what it was in 1900 and turned out to be 143,291, while the census reported 266,305 acres for 1899. In other words, the Agricultural Department seems to have failed to give as much weight to the figures of the Census Bureau for Idaho for the year 1899 in preparing its revised crop estimate for 1901 as it apparently accorded to those statistics in the other cases in which remarkable divergences between the figures of the census and the Agricultural Department had previously been noted. Why was this? Remembering that in Idaho irrigation and other forces have been at work of recent years, largely increasing the spring-wheat acreage, the conclusion must be drawn either that all the infor-

mation available about Idaho was incorrect, so that there had been a declining acreage in that state, as shown by the Agricultural Department returns, or else that the returns of the Census Bureau were grossly erroneous.

What has been said is enough to show that, so far as regards the "spring-wheat" group of states, the threats made by the Department of Agriculture as to the non-acceptance of the statistics of the Census Bureau for wheat were much louder than its action would warrant. In reality, no one who considers the foregoing analysis and the tabular matter presented can fail to see that the department, in spite of its talk, practically accepted the census figures, except in some few instances where, either owing to carelessness or some inexplicable circumstance, the proper changes were not made.

When we turn to consider the statistics of the census and of the Agricultural Department for corn, there appears a situation very similar to that which existed in the case of wheat. We need not, however, stop to consider the discrepancy with regard to corn in the same minute detail. In general, it is to be noted that whereas an acreage of 83,320,872 had been reported by the Department of Agriculture for 1900, it raised this figure to 91,349,928 in the *Year-Book* for 1901, or about 8,000,000 acres at one bound, the census having reported an acreage of 94,916,911 in the late winter of 1902 as the proper figure for 1899. This latter acreage

ACREAGE, PRODUCTION, ETC., OF CORN, 1890–1901.

Year.	Acreage.	Average Yield per Acre.	Production in Bushels.
1890.....	71,970.763	20.7	1,489,970,000
1891.....	76,204,515	27.0	2,060,154,000
1892.....	70,626,658	23.1	1,628,464,000
1893.....	72,036,465	22.5	1,619,496,131
1894.....	62,582,269	19.4	1,212,770,052
1895.....	82,075,830	26.2	2,151,138,580
1896.....	81,027,156	28.2	2,283,875,165
1897.....	80,095,051	23.8	1,902,967,933
1898.....	77,721,781	24.8	1,924,184,660
1899.....	82,108,587	25.3	2,078,143,933
1900.....	83,320,872	25.3	2,105,102,516
1901.....	91,349,928	16.7	1,522,519,891

had been reported by the department at 82,108,587 acres, or nearly 13,000,000 less than the figures given by the census. How absurd a face this comparison puts upon the previous figures furnished by the Department of Agriculture may be seen from the foregoing table, giving the statistics of corn as supplied by the department for the past decade. It deserves to be noted, in addition to what has already been said, that for 1899 the census reported 2,666,440,279 bushels of corn as against 2,078,143,933 bushels as returned by the Department of Agriculture, a small discrepancy of only about 600,000,000 bushels.

Just how the discrepancy thus noted with regard to corn is distributed over certain important states was clearly shown by Mr. Charles B. Murray in the following table of percentages, which represents the corn figures of the Census Bureau for 1899 expressed in terms of those of the department taken as a base:

	Acreage.	Yield per Acre.
Colorado	49	88
Illinois	149	108
Indiana	120	105
Iowa	125	126
Kansas	94	96
Kentucky	126	105
Michigan	152	100
Missouri	118	107
Nebraska	91	103
New York	131	97
North Carolina	111	100
Ohio	139	111
Oklahoma	248	152
Pennsylvania	118	109
Wisconsin	126	100
Entire country	115	110

Were we to trace the history of the corn figures of the department, it would appear that they were modified in very much the same way as those for wheat, in the effort to bring about a practical uniformity between the two sets of figures (and at the same time to maintain an appearance of rejecting the census returns), save that the changes were more widespread and less notable. Of course, the enormous increase in acreage

shown for 1901 by the figures of the *Year-Book* could not be attributed to any possible growth in area normally planted.

To sum up what has been said with regard to cereals, it seems sufficiently clear that the department, after refusing to be guided by the figures of the Census Bureau, really brought its returns largely into harmony with those of that bureau by giving the much disputed "due weight" to the latter. Yet, in order to preserve appearances, a very considerable discrepancy, both as to wheat and corn, was permitted to remain, and this in spite of the fact that such discrepancies grow worse during the ten-year period which elapses between our decennial censuses. What has been said of wheat and corn may be said with equal force of oats and other cereals.

An even more interesting discrepancy between the Census and the Agricultural Department returns is found in the figures for hay. As this discrepancy and its history furnishes one of the most striking examples of the methods employed by the Department, it seems worth while to discuss the returns for this product at considerable length. In the following table are given the hay crops as reported by the Department of Agriculture during the past ten years:

ACREAGE, PRODUCTION, ETC., OF HAY, 1890–1901.

Year.	Acreage.	Average Yield per Acre.	Production in Tons.
1890.....	50,712,513	1.19	60,197.589
1891.....	51,044,490	1.19	60,817,771
1892.....	50,853,061	1.18	59,823,735
1893.....	49,613,469	1.33	65,766,158
1894.....	48,321,272	1.14	54,874,408
1895.....	44,206,453	1.06	47,078,541
1896.....	43,259,756	1.37	59,282,158
1897.....	42,426,770	1.43	60,664,876
1898.....	42,780,827	1.55	66,376,920
1899.....	41,328,462	1.35	56,655,756
1900.....	39,132,890	1.28	50,110,906
1901.....	.....	....	.....

When the returns of the Census Bureau for the hay crop of 1899 were published early in 1902, an enormous discrepancy (like that which had occurred in wheat) was at once observed.

Whereas the census returned 61,691,166 acres of hay for 1899, as against 41,328,462 acres returned by the Department of Agriculture, the latter department, instead of correcting this error, seemed to have retained it, for, in 1902, it reported a hay crop for 1901 including 39,390,508 acres, which would apparently indicate that it preferred its own figures to those of the Census Bureau.

This discrepancy was noticed, of course, by students as soon as the revised returns of the Department of Agriculture for 1901 made their appearance. The statistician was at once asked to explain what ground could be afforded for the maintenance of the apparent error. In reply to questions on the subject it appeared that he regarded the figures of the department as standing for certain kinds of hay only. The reports of the Census Bureau had included a great variety of different kinds of hay, and recourse to the detailed figures of that bureau in fact showed that they were made up of returns representing tame and cultivated grasses, clover, timothy, alfalfa, etc., as well as forage, wild, salt, and prairie grasses and grains cut green for hay. The statistician, however, claimed that in making up their estimates for transmission to the Agricultural Department the correspondents of that department did not include either forage or wild, salt, and prairie grasses, or grains cut green for hay. It was very interesting to note that should the department consider its figures as excluding the forage, the wild, the salt, and prairie grasses and the grains cut green for hay, a very close correspondence was established between its returns and those of the Census Bureau. For the whole United States the acreage reported for "hay," whatever that might mean, by the department in 1899, was 41,328,462 acres, as against 39,243,555 acres reported by the census for hay exclusive of wild, salt, and prairie grasses, grains cut green, and forage crop. Leaving out the item of forage crop, and including only the other items, it appeared that the acreage reported for the United States by the Census Bureau was 42,350,796. The returns made by the department for 1901 were 39,390,508 acres. Taking the figures given by the Census Bureau and modifying them by the

annual percentages of the department for 1900 and 1901, a result of 38,957,167 acres would be obtained. The variation between the two statistical agencies would be considerably less than 450,000 acres, a discrepancy marvelously small in amount, and indicating almost preternatural accuracy and insight on the part of the correspondents of the Agricultural Department.

Unfortunately for persons who would like to accept the point of view thus suggested, it is impossible to confine attention to the gross hay returns for the country. There were troublesome questions which arose as soon as the effort was made to accept the views of the statistician. The question naturally suggested itself, if the figures for the department were to be taken only for the kinds of hay which it was sought to limit them, when was the change in classification made in the department's figures, and when were the wild and salt grasses, and grain cut green excluded? They were certainly included in the census of 1890, upon which the regular annual estimates of the department had always been supposed to have been based. Thus was offered a consideration in apparent conflict with the explanation afforded by the statistician, when he said the word "hay" had always been understood by the correspondents of the department to include only ordinary kinds of hay and not grain cut green for that purpose, nor wild, salt, and prairie grasses, these being irregular crops upon which the Agricultural Department did not and could not give advance estimates. When attention was turned to the detailed figures for the hay crop, as given by states, the difficulty came to a climax. In the following table a detailed estimate specially computed is furnished.

This estimate gives the figures of the Census Bureau for the hay crop of 1899, both including and excluding the disputed kinds of hay. The returns for the Department of Agriculture for "hay" (whatever that may mean) are also given, and the figures of the census, as they would appear in 1901 had the statistician accepted them *in toto* for 1899, and merely modified them by the application of his department percentages. The difficulty

States and Territories.	Census. All Hay Crop. 1899.	Exclusive of Wild, Salt, and Prairie Grasses, Grains Cut Green, and Forage Crop 1899.	Exclusive of Wild, Salt, and Prairie Grasses and Grass Cut Green. Census of 1899.	Same as Column 3, Modified by Department Percentages of 1900 and 1901.	Department. 1899.	1901.
The United States.....	61,691,166	39,243,555	42,350,796	38,957,167	41,328,462	39,390,508
North Atlantic Division.	12,919,041	12,210,917	12,573,780	12,527,619	.....	12,440,920
Maine	1,270,254	1,225,674	1,238,168	1,259,959	976,848	1,253,259
New Hampshire	615,042	572,080	583,471	589,189	602,097	607,622
Vermont	1,006,375	942,231	981,751	1,021,414	843,235	965,498
Massachusetts	610,023	539,159	562,794	561,893	590,707	588,836
Rhode Island	69,776	61,881	64,664	64,657	73,008	65,262
Connecticut	478,555	441,412	454,857	464,000	475,482	470,633
New York	5,154,965	4,877,661	5,067,262	5,102,733	4,356,064	5,064,633
New Jersey	444,610	375,403	400,031	404,031	392,191	412,203
Pennsylvania	3,269,441	3,175,416	3,220,782	3,059,743	2,557,475	3,012,974
South Atlantic Division.	2,161,201	1,857,284	1,912,589	1,820,998	....	1,800,312
Delaware.	74,800	63,501	66,569	67,155	46,750	75,617
Maryland	374,848	359,111	363,005	337,958	282,992	317,172
District of Columbia ..	1,228	1,006	1,047	1,047	.....	.....
Virginia.....	612,962	559,858	569,735	552,073	534,603	543 578
West Virginia.....	601,935	586,004	587,968	552,278	498,998	544,888
North Carolina	229,998	152,319	160,764	148,160	130,526	146,817
South Carolina	106,124	52,660	56,252	56,815	144,354	60,724
Georgia	137,312	68,705	90,686	90,605	109,287	96,791
Florida.....	21.994	14,120	16,563	14,907	5,942	14,725
North Central Division..	35,676,042	20,919,506	22,750,955	19,575,952	.....	20,148,273
Ohio.....	3,015,261	2,910,261	2,950,900	2,887,456	1,641,307	2,883,903
Indiana	2,442,414	2,164,742	2,236,936	1,889,764	1,562,221	1,880,148
Illinois.....	3,343,910	2,881,227	3,002,853	2,568,640	1,833,884	2,591,858
Michigan	2,328,498	2,179,317	2,226,343	2,182,039	1,352,766	2,215,724
Wisconsin.....	2,397,982	1,870,190	1,936,051	1,548,841	1,324,298	1,654,152
Minnesota.....	3,157,690	887,912	934,763	787,444	1,514,841	809,342
Iowa	4,649,378	3,150,890	3,329,299	3,129,541	3,750,727	3,165,229
Missouri	3,481,506	3,109,541	3,189,032	2,363,072	2,258,682	2,475,829
North Dakota	1,410,534	124,375	140,492	112,112	384,048	127,755
South Dakota	2,287,875	163,435	194,395	173,205	1,943,688	176,875
Nebraska	2,823,652	441,831	532,659	405,650	2,034,758	524,904
Kansas.....	4,337,342	1,035,785	2,077,232	1,468,188	3,284,018	1,642,554
South Central Division..	3,883,662	1,533,986	2,288,477	1,953,949	.....	1,859,568
Kentucky	683,139	599,782	621,430	514,606	306,173	510,412
Tennessee.....	645.617	421,185	452,771	391.556	243,348	392,362
Alabama	85,353	51,108	66,816	59.974	49.847	58,401
Mississippi	99,261	38.593	43,660	42,228	54,902	49,599
Louisiana	97,136	19,152	25.227	23,726	25,405	23.878
Texas	938,024	237,294	599,894	464,438	311,156	442,415
Oklahoma....	695,313	58,181	333,297	333,297	.....	252,172
Indian Territory ...	400,393	20,295	40,198	40,198	.....	47,667
Arkansas.....	239,426	88,396	105.184	83,926	138,845	82,662
Western Division.....	7,051,123	2,721,847	2,824,961	3,078,615		3,141,435
Montana	875,712	265,325	267,751	289,492	361,923	285,096
Wyoming	380,769	121,793	123,699	140,275	271,961	143,146
Colorado.....	952,214	546,708	569,936	592,904	776,321	617,233
New Mexico	87.358	58,555	63.268	70,683	38,310	79,205
Arizona	92,674	63,770	66,900	67,435	27,624	70,938
Utah	388,043	311,189	313,654	304,307	194,341	307,028
Nevada	292,134	124,787	124,923	118,752	157.480	127,608
Idaho	513,656	274,909	281,535	316,079	215,958	328,377
Washington	497,139	212,841	220,524	298,700	303,794	298,948
Oregon	731,823	275,278	283,384	323,738	637,190	333,531
California	2,239,601	466,692	509,387	556,250	1,708,087	550,325
Hawaii.....	19	.....	19	19	.....	.....
Alaska.....	78	15	15	15	.....	.....

becomes at once apparent when we review the figures for the different states. In certain western states, notably Kansas, the Dakotas, Nebraska, and Minnesota, the crop of wild and prairie grasses always constitute the larger part of the hay crop. In California the same is true of grains cut green for hay. If, now, correspondents of the department in those states had understood in 1899 that their returns were to exclude these principal hay crops of their localities, they could not have reported anything like the acreage they did. Glancing at the returns for 1901, as given for hay in the states already mentioned, it appears that the decrease in acreage must, if the figures of the department were correct, have been stupendous. In California an acreage of only 550,325 for 1901, as against 1,708,087 for 1899, is reported; in South Dakota only 176,875, as against 1,943,688; in Nebraska only 524,904, as against 2,034,758; and in Kansas only 1,642,554, as against 3,284,018. Had there been any such agricultural revolution in the West and far Southwest as was thus indicated? Had the correspondents of the Agricultural Department discovered far reaching changes in agriculture unknown to other persons? The facts are against such a supposition. Moreover, when an examination of the hay crop for California is made by counties, it appears that in many places almost the only hay crop consists of grains cut green. In that section of the country, as well as in the northwestern states referred to, it would seem that the correspondents of the Agricultural Department, in giving their estimates, must have had in mind precisely the classes of hay which, on the basis of estimate now announced, are said to have been excluded. There is no other way in which to account for the enormously higher estimates of the Agricultural Department relative to the acreage given up to hay in these states in 1899, as compared with that reported by the department for 1901. The figures for Kansas are certainly inexplicable, if the department's estimates for 1901 exclude forage as well as grasses cut green and prairie grasses. Then, too, a further comparison between the figures of the department and those of the Census Bureau, with reference to the great hay producing states of the North Atlantic division, shows many

wide divergences hardly to be accounted for otherwise than by a reclassification of hay effected in the offices of the Statistical Division of the Agricultural Department, and not by the correspondents of that department acting on their own responsibility. It would seem that the statistician must have been mistaken in his statement that the estimates of the correspondents were not intended to include the hay crops just referred to. If a reclassification actually occurred in the way that has just been suggested he might, however, claim a justification from precedent. It is not many years since a statistician of the Agricultural Department, on finding that a table furnished by him under the caption, "Animals on Farms and Ranges" agreed, not with the census returns for the same items, but only with those for "Animals on Farms," cut the Gordian knot of the disagreeable situation in which he found himself by merely omitting from the caption of his table the words "and Ranges," leaving the table to represent "Animals on Farms" — a masterpiece of skill in the adjustment of statistics.

In dealing with the figures for live stock, a peculiar problem is presented. The live-stock figures of the Agricultural Department long ago got into a hopeless tangle. How fully the problems connected with them were recognized by the statistician of the department may be seen from an announcement embodied in the *Year-Book* for 1900 (p. 824). That announcement read as follows:

> Pending the forthcoming publication of the census report on live stock, which will be used for the verification or correction of the department's figures for the year 1900, the statistician has temporarily discontinued his own estimates of the number and value of farm animals.

The department has, in fact, published no statistics for swine since January 1, 1899, or for other animals since January 1, 1900, and it is understood that the statistician is working upon the live-stock problem at the present moment, but that grave difficulties are being experienced in giving any semblance of probability to the department's earlier returns.

Certain important questions stand out conspicuously in studying the live-stock figures. How important it is that the real nature and origin of the trouble should be understood can pos-

sibly be realized only by those traders who have occasion to make constant use of the returns furnished by the department, and by those who have made a serious study of the subject. The two points about which the main difficulty seems to center at the present time are found in the statistics for sheep on farms and ranges, and for oxen and other cattle on farms and ranges. Going back to the census of 1890, it appears that in 1893, after the statistics of the eleventh census had become available, certain adjustments of some of the figures were probably made by the statistician of the Agricultural Department. The precise statistical situation with regard to these kinds of cattle may be best seen by arranging some of the figures as follows :

OXEN AND OTHER CATTLE ON FARMS AND RANGES.

A comparative exhibit of the number reported by the census June 1, 1890, and by the statistician of the Department of Agriculture January, 1890 and 1893 :

States.	Census.	Statistician.	
	1890.	1890.	1893.
North Atlantic Division	2,110,663	2,359,476	2,239,336
South Atlantic Division	2,520,641	2,615,089	2,512,174
South Central Division	11,670,489	9,955,006	9,215,067
Western Division	8,474,615	8,239,994	7,902,489
North Central Division	16,360,434	13,679,459	14,085,130
Ohio	968,554	986,601	845,512
Indiana	932,621	957,843	1,063,531
Illinois	1,975,233	1,713,966	1,538,003
Michigan	549,160	547,716	463,134
Wisconsin	855,327	805,170	820,236
Minnesota	779,671	617,256	648,365
Iowa	3,397,132	2,577,161	2,704,342
Missouri	2,118,640	1,515,935	1,831,856
North Dakota	193,585	.....	255,680
South Dakota	506,712	822,017	389,500
Nebraska	1,637,552	1,306,372	1,566,236
Kansas	2,446,247	1,829,422	1,958,735
United States	41,136,842	36,849,024	35,954,196

In looking over these tables, the first question which naturally rises in the mind of the student is this: Did the Division of Statistics ever accept and adjust its figures for oxen and other neat cattle with those of the eleventh census, and, if so, when? If it did, what is the explanation of the wide difference between

SHEEP ON FARMS AND RANGES.

A comparative exhibit of the number reported by the census June 1, 1890, and by the statistician of the Department of Agriculture January, 1890 and 1893:

States.	Census.	Statistician.	
	1890.	1890.	1893.
North Atlantic Division	4,133,027	3,817,302	4,162,925
South Atlantic Division	2,445,386	2,168,321	2,518,694
North Central Division	12,332,154	11,901,259	14,130,619
South Central Division	7,027,197	6,984,688	7,350,907
Western Division	14,938,548	19,464,302	19,110,408
Montana	2,352,886	1,989,845	2,528,098
Wyoming	712,520	1,017,373	1,198,567
Colorado	896,810	1,783,891	1,231,484
New Mexico	2,474,494	3,092,736	2,730,082
Arizona	515,136	698,404	580,879
Utah	1,936,906	2,055,900	2,117,577
Nevada	273,469	700,986	555,181
Idaho	357,712	487,357	764,262
Washington	265,267	673,060	823,825
Oregon	1,780,312	2,929,830	2,456,077
California	3,373,036	4,035,120	4,124,376
United States	40,876,312	44,336,072	47,273,553

the figures of the census and those of the statistician as revealed in the foregoing comparative statement? If it never accepted the census figures, what was the reason for such non-acceptance?

It is clear that, starting with a basis which, as appears from the above table for oxen, was about 5,000,000 short of the census number in 1893, and keeping the system of percentages used during the preceding decade, it must be expected that this divergence would increase at a compound ratio, and that the immense discrepancy which now exists would be an absolutely unavoidable and necessary outcome. The inference from the table for oxen seems to be that the adjustments were made, or partially made, with the eleventh census in some few groups of states, but that in the main agricultural states, where cattle were extensively raised, the discrepancy was perpetuated.

Referring to the table just given for sheep, the query arises why, although the figures of the census were accepted in 1893, (after the returns had become available) for the north Atlantic,

the south Atlantic, and the south central groups of states, they were not accepted for the western states. It might be answered that in some instances in the western states the number of sheep on ranges had been estimated by the census, just as it had been by the Agricultural Department, and that the latter department felt quite as fully justified in retaining its own estimates of sheep on ranges as in accepting the estimates of the census for the same facts. This, however, would not explain the divergence to be noted in regard to sheep in the north central division of states, a divergence of no small importance, as may be seen from the tables already given.

The statistical difficulties just sketched are not all. When we consider the tables of average values of sheep, horses, mules, and other animals reported by the Division of Statistics, we enter upon a field in which there appears to be little continuity and uniformity in the figures furnished by the department. Here also the problem of reconciling discrepancies — this time between the department's own figures for different years — presents itself. In all such inquiries the first and most necessary point upon which to gain assurance is whether the returns furnished for successive years relate to precisely the same facts or phenomena. In the present instance, the inquiry which thrusts itself to the front is this: "Has any portion of the variations been caused by a change in the classes of animals included in the reports of the Division of Statistics?" Of course, the change in classification, if there was any, would naturally occur in the case of young animals. Briefly stated, a doubt might arise in the minds of enumerators as to when an animal was to be counted. Manifestly the earliest point at which a young animal could be counted would be at the time of its birth. But animals just born might be reckoned as of small value prior to the time when it appeared certain how many of them would continue to live. Some authorities think that young animals, as such, ought not to be counted below the age at which they have a market value as food, or as animals to be reared. Of course, estimates might differ as to the best age to be selected for such a division of animals, and doubtless ages would differ as between

different animals, were the selection to be made on closely and accurately defined principles. Roughly speaking, however, a year is a sufficient time within which to judge of the worth of young animals, and the question of enumeration practically reduces itself to this:

Shall animals below a year in age be reckoned as animals? Shall they not be reckoned under a separate classification as young animals? Inasmuch as the birth of animals in many instances takes place most largely at specified seasons, it is clear that a difference in classification, either between the census and the Agricultural Department, or between the correspondents of the Agricultural Department for different years might result in great variations in the returns of the two bureaus.

To make this inquiry concrete we may ask: Did the Division of Statistics in the figures before us include in any years animals less than a year old, and did it in other years omit them? An answer to this question may go a good way toward resolving the difficulties already outlined.

A close study of the figures of the department seems to indicate that animals below a year in age were always included. It appears that the average value of sheep is given for those which were less than a year old, as well as for those which were more than a year, and by no process of average can the values quoted in the *Year-Books* be justified for sheep except by supposing that the young animals referred to were actually included. This also is the statement of authoritative persons in the Agricultural Department, although the statistical division has several times refused to explain the basis upon which its estimates for animals was made up, or to indicate distinctly whether those below a year old were actually taken in by the earlier estimates. Granting that the figures of the Agricultural Department actually include young animals, the question arises whether at the present time the difficulties in harmonizing the livestock figures of the Department of Agriculture with those of the Census Bureau may not be due to changes in classification. It would appear that, since 1897, the Division of Statistics has ceased the publication of detailed esti-

mates of the average value of animals of various ages. Whether this was due to the change in character of the animals included in these estimates it would be extremely interesting to ascertain. How important this point might become will be realized when account is taken of the difference between the date for which the census figures are gathered and that for which the returns of the Agricultural Department are made. The census figures represent conditions on June 1, while those of the Agricultural Department are for January 1. During these intervening months many changes in animals are caused by the slaughter of old ones and the birth of young, so that here apparently there is a suggestion of the reason for some variations. How far the great divergence which now exists between the two bureaus is due to the errors made in 1890 and the succeeding years, and how far to a jumble in classification is a matter which can be decided only by a historical review of the live-stock methods of the Agricultural Department. In a Washington letter to the New York *Journal of Commerce and Commercial Bulletin*[1] that history was sufficiently outlined in the following passage:

In 1860 the census secured individual reports of live stock from farmers, and estimates by the marshals of all live stock in their districts not thus reported on farms. These estimates of the marshals included all live stock on ranges, in cities, in stock yards, or in transit. About 1864 a statistician, with assistants, was appointed by the commissioner of agriculture. Among the duties of that statistician was the preparation of annual estimates of the number of each class of live stock. In arranging for those estimates the statistician used as his basis the combined reports and estimates of the preceding census. Those estimates were corrected in January, 1872, by the census reports and estimates of 1870. Those census reports and estimates were in their character essentially the same as in 1860. The statistician, in his report for 1871, uses the following language with reference to his estimates, explaining the difference between the census reports of animals on farms and his estimates of all live stock:

"As the census schedules provide only for enumeration of domestic animals on farms, an estimate of farm animals in cities and stock yards has also been included, as large numbers pastured on public lands, especially in the Pacific states and in the territories. Less than half the cattle and sheep of the territories are returned by marshals under the present census law."

[1] September 19, 1902.

An examination by states of the figures of the statistician, and a comparison of the same with those of the census, show that those of the statistician included all live stock, those on farms, in cities, and on the range. Hence the designation adopted as the title to the table of animals made use of by the statistician nearly every year prior to 1883. This was "table showing the estimated total number and total value of each kind of live stock."

The statistician in accepting the census figures of 1870 and adjusting his estimates thereto, as explained above, had to make considerable changes in his estimates for the number of sheep, dropping the same about 9,000,000. The changes for other animals in the country as a whole were inconsiderable, although there were marked changes in a few states.

The census of 1880 included reports of individual farmers, as in all preceding years. It also secured and published estimates of certain classes of animals on ranges, but prepared no reports or estimates of live stock in cities and towns and not on farms. The statistician made his figures to conform with those of the census, and thus included, after January, 1883, animals on farms and ranges only. The title of his table for animals was changed. For 1884 to 1877, it was "Table showing the estimated number of animals on farms, total value of all kinds and average price." In 1888 the table was changed by inserting "and ranches" after farms, and this continued to be used until 1896, when the words "and ranches" were dropped and other changes made. For most of the time since that year the title has been "Number, average price, and total value of farm animals in the United States."

Though the word "ranch" or "range" was not used in the title before 1888, the statistician does use that word in his statements embodied in the text for some of the years. Such statements clearly show, as does a comparison of census figures with those of the statistician, that in all years the statistician, after 1883, included in his estimates the animals on ranges, but not those in cities.

The census having published in 1891 its figures for horses and mules on farms and for all range states, the statistician, as he states in his report February 12, 1892, adjusted his estimates to the census of farms and ranges for horses and mules. An adjustment was made for sheep, cattle, and swine in 1893 in some of the states, but in others the statistician does not seem to accept the census figures.

A careful analysis and comparison of the sheep statistics of the two offices show that the statistician of agriculture practically accepted the census figures for all states in which the shepherds did not use the public domain or range. In those states and territories, particularly those of the western division, the statistician practically adhered to his own figures and paid but little attention to those of the census. For the range states and territories the census had obtained returns of the sheep and other animals on farms, and estimates for some of those states and territories of the animals on

ranges. The statistician seemingly deems his estimates as trustworthy as those of the census, and hence did not make any change in his figures or adapt them in any way to those of the census. Thus the census reported for the eleven states and territories of the western division, 10,806,999 sheep on farms, and a total of 14,938,548 on farms and ranges. This was for June, 1890. The statistician for the same states and territories, January 1, preceding, had estimated the total as 19,464,502, or 4,500,000 more. In January, 1893, he modified this, only to bring it to 19,110,408. Here we have one case where for a wide territory the statistician of the Agricultural Department did not accept the figures of the census as a basis for his future estimates, the apparent reason being that a large part of the census figures for those states were estimates, and the statistician preferred the estimates made by his division to those of another bureau.

The statistician had at the same time, at the close of 1892, taken the figures of the census, readjusting his estimates for oxen and other neat cattle. An examination of his figures as published for 1893, and a comparison of the same with those of the census, makes it plain that the statistician accepted the census farm reports only in a portion of the nation. In the north central states the census enumerators found a total, June 1, 1890, of 16,360,434 animals on farms and ranges, of which only 29,033 were on ranges. The preceding January the statistician estimated for these states only 13,679,459, and for January, 1893, after the census figure were available, his estimate was only 14,035,130. The most marked case of rejection of census figures and the maintenance of his own estimates is found in Iowa. The census reported 3,397,132 oxen and other cattle. The statistician, the preceding January, reported 2,577,161. For January, 1891, he reported 2,680,247; for January, 1892, 2,707,059, and January, 1893, after receiving the census report, only 2,704,342. In like manner the census for Kansas reported 2,446,247. The statistician in 1890 estimated only 1,829,422, and in January, 1893, after the census figures were available, only 1,958,735.

The continued use of his own estimates instead of the census figures of oxen and other cattle made a difference in the nation of about 5,000,000, and for the great cattle-growing north central states of nearly 3,000,000. This was the basic error of the statistician in 1893, the year in which he is supposed to start all his calculations from the census. The census figures of 1890 demonstrated that the statistician's methods had, prior to that time, produced an error of nearly 5,000,000 in the preceding decade, but instead of correcting that error it was preserved as a virtue and continued for the next decade, and the result is shown that the census reports in the north central states 14,803,628 other cattle one year old and 7,309,187 calves, or a total of 22,112,815 where the statistician reported January 1 preceding only 12,087,833. Making allowance for the variation that actually does take place between January 1 and June 1, owing to the slaughter of old and the birth of young animals, it may be said that the error in the division of

statistics is approximately that represented by the difference between 18,000,000 and 12,000,000. This error of 1900 practically all grew out of the refusal or neglect of the statistician to be guided by the census figures of 1890, and the error of 25 per cent. of that year became one substantially of 50 per cent. ten years later. As the statistician in charge since 1897 was the gentleman in charge of the census of agriculture in 1890, it is inexplicable how the old error of the statistician's office has been allowed to continue and to grow with the passage of years. The error of 5,000,000 in the reported number of oxen and other cattle for the whole nation in 1890 has become, by 1900, about 14,000,000, allowing for a variation in the number of neat cattle between January and June of about 7,500,000.

A large part of this blunder seems to be a direct result or the refusal or neglect of the statistician of the Agricultural Department to be guided by the census of 1890. Another part is chargeable to the census of that and preceding years. The inquiries of those census years were so formed that no one could tell them from the published data whether any or all young animals were enumerated with the older ones. The census itself did not give any definite information upon the subject. The significance of the census figures for other neat cattle of 1890 is vastly different if the 14,000,000 calves of that year are or are not included with the 14,000,000 other neat cattle reported by it.

We have thus seen that the Department of Agriculture has practically confessed the breakdown of its statistics with regard to live stock. A similar confession has been made in the case of tobacco. Shortly after the present statistician assumed office, he discontinued the publication of figures for that crop, and since then has not attempted further specific and detailed inquiry into the subject. Why this step was taken may easily be seen by a brief study of the tobacco statistics of the department. The following table represents the returns for tobacco furnished by the department in the *Year-Book* for 1898.

From a study of this table several things are at once apparent. Running the eye down the column of figures, the student is at once struck with the fact that a general and very considerable decrease in the production of tobacco is noticeable for several years prior to the close of the statistics. That such a tendency is wholly out of harmony with the facts in the case, even a superficial student of the tobacco situation must be well aware. Both the production and the consumption of tobacco in this country are notoriously on the increase. A falling off,

Year.	Tobacco.		
	Area (in Acres).	Production (in Pounds).	Value (in Dollars).
1866.....	520,107	388,128,684	37,398,393
1867.....	494,333	313,724,000	29,572,660
1868.....	427,189	320,982,000	29,822,873
1869.....	481,101	273,775,000	25,520,065
1870.....	330,668	250,628,000	24,010,018
1871.....	350,769	263,196,100	23,292,645
1872.....	416,512	342,304,000	31,647,817
1873.....	480,878	372,810,000	28,421,703
1874.....	281,662	178,355,000	21,066,515
1875.....	559,049	379,347,000	26,453,881
1876.....	540,457	381,002,000	25,923,894
1877.....	.....	.....	.....
1878.....	542,850	392,546,700	22,093,240
1879.....	492,100	391,278,350	22,727,524
1880.....	602,516	446,296,889	36,414,615
1881.....	646,239	449,880,014	43,372,336
1882.....	671,522	513,077,558	43,189,950
1883.....	638,739	451,545,641	40,455,362
1884.....	724,668	541,504,000	44,160,151
1885.....	752,520	562,736,000	43,265,598
1886.....	750,210	532,537,000	39,468,218
1887.....	598,620	386,240,000	40,977,259
1888.....	747,326	565,795,000	43,666,665
1898.....	695,301	488,256,619	32,396,740
1890.....	722,198	522,215,116	43,100,532
1891.....	742,945	556,877,039	47,492,584
1892.....	725,195	498,621,686	46,728,959
1893.....	702,952	483,023,963	39,155,442
1894.....	523,103	406,678,385	27,760,739
1895.....	633,950	491,544,000	35,574,220
1896.....	594,749	403,004,320	24,258,070
1897.....	.....	.....	.....

therefore, in the production of tobacco from 563,000,000 pounds in 1885, to 403,000,000 pounds in 1896, must be reckoned an absurdity. As a matter of fact, it is clearly shown to be such by the following table which gives the amount of tobacco exported as indicated by the statistics of the Treasury Bureau of Statistics, and the amount consumed as indicated by the returns of the Internal revenue office.

The absurdity of the discrepancy thus revealed is even greater than at first sight appears. It should be remembered that the statistics of the Agricultural Department are given for the product on the farm. Everyone is of course, familiar with the fact that tobacco suffers a serious shrinkage before it reaches the

POUNDS, OF DOMESTIC TOBACCO, INCLUDING EXPORTS, AND CONSUMPTION IN MANUFACTURES: 1879–1900.

Year.	Domestic Tobacco Consumed and Exported.	For Calendar Year Following the One Named.		
		Exported (Domestic).	Net Import of Foreign Leaf.	Consumed by Manufacturers (Total).
1900.....	668,978,632	308,743,593	26,038,067	[1] 386,273,106
1899.....	662,818,341	305,033,235	21,377,778	379,162,884
1898.....	698,532,639	346,823,677	15,430,348	367,139,310
1897.....	610,860,256	269,966,833	8,984,314	349,877,737
1896.....	632,089,413	281,074,422	11,069,640	362,084,631
1895.....	612,171,397	300,047,687	17,491,250	329,614,960
1894.....	609,975,591	293,637,217	28,295,514	344,633,888
1893.....	621,507,952	304,797,808	23,122,539	339,832,683
1892.....	587,784,776	277,258,871	20,481,407	331,007,312
1891.....	590,179,303	259,410,020	25,339,653	356,108,936
1890.....	577,832,455	246,137,301	18,244,045	349,939,199
1889.....	555,054,048	255,427,121	26,792,826	326,419,753
1888.....	569,841,023	265,693,100	22,346,741	326,494,664
1887.....	484,830,133	216,673,665	15,431,708	283,588,176
1886.....	543,900,132	260,947,155	18,026,894	300,979,871
1885.....	588,461,089	313,311,017	14,103,052	289,253,124
1884.....	550,397,262	289,514,345	15,516,426	285,399,343
1883.....	451,176,211	[2] 209,041,923	11,996,171	254,130,459
1882.....	503,277,288	239,584,814	14,289,539	277,982,013
1881.....	456,705,582	225,525,793	10,355,171	241,534,960
1880.....	455,065,396	218,244,309	8,745,679	245,566,766
1879.....	433,428,777	225,737,672	8,774,233	[3] 216,465,338

stage where it can be exported, or is subject to taxation. If, therefore, the figures given in the last table were placed upon the same basis as those furnished by the Division of Statistics in the Agricultural Department, the variation would be enormously heightened. In short, there is no crop in which the inefficiency of the methods pursued by the Department of Agriculture seems to stand out more clearly than in the case of tobacco, as is shown both by the fact that the statistics seem to have been discontinued and by the further fact that they vary so widely from what is known concerning the tobacco situation. Of late years all that the Department of Statistics seems

[1] Return from manufacturers for 1901 not received; preliminary estimates used.

[2] After July, 1883, exports include also "skins and trimmings;" before that date, "leaf only."

[3] No returns published earlier than 1880.

to have done is to furnish a reprint of returns supplied by the Internal Revenue Office and the Treasury Bureau of Statistics. Of course, these returns, as already remarked, do not represent, even approximately, tobacco on the farm.

In this connection, we may take account of the figures reported by the census on this same subject. According to the census figures for 1899, the amount of tobaccco grown was 868,163,275 pounds, while the amount consumed in factories and exported, as shown by the table already given, was, in 1900 (the year immediately following the crop year of the census) only 668,978,632. In other words, an excess of about 200,000,000 pounds was reported. This excess requires explanation, if the census figures are not to be discredited. The writers of the text relating to tobacco in the twelfth census have largely, however, accounted for it. We cannot do better than to quote from Part II, Vol. VI, of the census.

> The farmers report the weight of their tobacco after it has been cured. After curing the tobacco is sold by the farmers to the leaf dealers who dry and "sweat" the leaf, as the process is popularly called, and in drying, a considerable portion of the weight is lost. This loss has been variously estimated at from 15 to 20 per cent. The loss by drying is unquestionably the main cause of the difference between the quantity of tobacco reported by the farmers and that of the aggregate quantity of domestic tobacco used by manufacturers and the quantity exported. There are, however, a number of minor losses that should be mentioned. The most important of these is that caused by the stemming of the tobacco that is shipped to England. This loss has been estimated at about 3.5 per cent. of the total weight of the tobacco crop of the country. There is also a small annual loss by fire, and, so far as statistics of the crop are concerned, a small loss due to home consumption by farmers and the sale of tobacco to their neighbors. The per cent. of loss due to each of these causes is about one-half of 1 per cent. Every time the tobacco is handled, from the time it leaves the farmer until it assumes its final form in cigars or manufactured tobacco, there is a loss of weight. Further, some of the tobacco grown in 1899 was not sold at the date of enumeration in 1900, and it is possible that the farmers may have overestimated its weight.

That this explanation covers the ground is perhaps not wholly certain, pending a furthur study of tobacco conditions. It deserves to be noted, however, that Mr. Milton Whitney, of the

Department of Agriculture, accounts very satisfactorily for a large part of the variation, somewhat on the lines mentioned by the census in the quotation already given, and that his testimony, so far as it goes, must be granted the highest authority. In the New York *Journal of Commerce and Commercial Bulletin*,[1] Mr. Whitney's views were given substantially as follows:

We export about 90,000,000 pounds of tobacco to England each year, and it is there subjected to so heavy a duty on entering that country that dealers esteem it highly desirable to eliminate as much waste as possible from the shipment, and to see that no more moisture is contained in it than can possibly be helped. For this reason the tobacco is stemmed and very carefully dried before being exported to England. Mr. Whitney thinks that there may possibly be 30,000,000 pounds of shrinkage from these causes, so that the 90,000,000 pounds reported by the internal revenue office would be 120,000,000 pounds as reported by the farmers. Then, again, there is great loss in weight by shrinkage in the tobacco used for cigars and cigarettes, owing to fermentation. Probably as much as 30,000,000 pounds is thus lost in getting the 120,000,000 pounds of cigar and cigarette tobacco which is reported by the internal revenue office, so that when this leaves the farm it is nearer 150,000,000 pounds. Thus 60,000,000 pounds' discrepancy are accounted for, and Mr. Whitney hinted that similar causes of difference might be found sufficient to make 100,000,000 pounds in all.

This, however, still leaves 100,000,000 pounds to be accounted for, and Mr. Whitney suggests a possible source for this discrepancy also. The census returns are taken for June 1. Now, on that date it is seldom that the crop has been sold by the farmers; usually it is largely in storehouses. The figures given by farmers to census enumerators would, therefore, be merely estimates — estimates which would be almost certain to be too high, because of a natural tendency to overestimate the amount on hand and because of the tendency of the tobacco to lose weight while stored.

On the whole, it appears probable that the discrepancy apparently to be noted between the census and the treasury returns is explained. But whether this be true or not, it is perfectly certain that the inefficiency of the methods of the Department of Agriculture as relates to tobacco is abundantly confessed.

A rather different situation appears when we come to consider the figures for cotton furnished by the two statistical bureaus now under consideration. According to the twelfth census, the amount of cotton baled (commercial bales) was 9,534,707 bales

[1] For May 12, 1902.

in 1899. On the other hand, the statistics furnished by the Department of Agriculture for the same year showed 9,142,838 bales. The acreage reported by the census was 24,275,101, while the acreage reported by the Department of Agriculture was 23,403,497. In other words, there appears to be a discrepancy between the two bureaus amounting, roughly, to 400,000 bales and 870,000 acres. Comparing this discrepancy with the discrepancies existing in other crops, the variation does not seem to be extravagant. It amounts to but a few per cent. and is, one might think, quite excusable, in view of the fact that a process of estimate must be employed by the department. In drawing our conclusions, however, it should be recollected that a severe standard of judgment must be applied in the case of cotton. As the twelfth census expresses it:

> The collection of statistics of the cotton crop has never been attended by any great difficulty, and statistics of no agricultural product are more reliable than those of cotton. The entire crop of each year is sold. The farmer knows exactly the quantity grown and the price received for it, whereas a considerable quantity of most other crops is consumed upon the farm and the quantity and value are estimated.

The fact that the statistics of the Department of Agriculture have attained a degree of correctness has been the cause of some self-gratulation on the part of the officers of that department. In a letter written by Hon. James Wilson, secretary of agriculture, to Senator W. B. Allison,[1] at a time when it was proposed to vest the Division of Manufactures in the Census Bureau with authority to collect regular returns concerning cotton ginning, the following rather florid claim was put forward:

> In October, 1899, however, two special field agents (a number subsequently increased to four) were appointed and various new sources of information were made available, it being the duty of such field agents to watch carefully the development of each important crop throughout the entire period of its growth, and to keep in close touch with the best-informed opinion in regard to conditions and prospects. The result of this addition to the department's crop-reporting service was quickly seen in its preliminary estimate of the cotton crop of the year 1899–1900, which, though made as early as December 1, 1899, proved to be within 1 per cent. of the actual crop, as determined by its subsequent movement.

[1] *Crop Reporter*, March, 1902.

The following year the department began the collection of cotton statistics from ginners, making up for that purpose, through its various agencies, the most complete list of ginners that is today in existence. Then followed the department's preliminary estimate of the cotton crop of 1900–1, which, like its immediate predecessor, was subsequently demonstrated to have been within one or two bales in each hundred of the crop actually produced.

As we shall see at a later point in this discussion, the task of gathering the ginning figures was, however, assigned to the Division of Manufactures in the Census Bureau, and was by it begun. These statistics furnish an excellent check upon the returns of the Agricultural Department, and representing as they do exact conditions, they show most clearly where the defects of the Agricultural Department really lie.

In spite of the fact that the Department of Agriculture has prided itself so largely upon its cotton returns, the fact remains that there has never been greater dissatisfaction with any figures published by the Agricultural Department than with those for cotton for 1902. This point, however, should be noted: The dissatisfaction strongly manifested by cotton experts throughout the country during 1902 has been produced by the condition figures of the department, its final returns, of course, being not yet made up for the year. In a minor degree, there has been dissatisfaction regarding the reports for acreage given out by the statistician for the year 1901. The condition reports have failed to harmonize with the best figures of commercial estimators, and the acreage returns already referred to have not been harmonized with those of the census. A few words regarding these facts must suffice.

According to the publications of the Department of Agriculture, the cotton returns of that department for a series of years last past have been as in the following table.

We have already seen how far these figures vary from those of the census. It has been shown, moreover, that in cotton at least there is no ground for very wide discrepancies in reports of production. The controversy, in fact, must confine itself largely to acreage. The real question between the census and the Agricultural Department, therefore, has been whether the

ACREAGE, PRODUCTION, ETC., OF COTTON, 1890–1900.

Year.	Acreage.	Average yield per acre (in bales).	Production (in bales).
1890.....	20,809,053	.42	8,652,597
1891.....	20,714,937	.44	9,035,379
1892.....	18,067,924	.37	6,700,365
1893.....	19,525,000	.39	7,549.817
1894.....	23,687,950	.42	9,901,251
1895.....	20,184,808	.36	7,161,094
1896.....	23,273,209	.37	8,532,705
1897.....	24,319,584	.45	10,897,857
1898.....	24,967,295	.45	11,189,205
1899.....	23,403,497	.39	9,142,838
1900.....	.....	...	10,401,453

department would accept the cotton acreage of the Census Bureau or not. After the figures of the census for 1899 had been made public and had been given "due weight," the statistician of the department remarked (*Crop Reporter*, June, 1902):

> Adjustments have been made to bring the department's estimates into reasonable conformity with the report of the census, the net result being an addition of about 418,000 acres to the estimate of the area planted last year.

As we have seen, the variation in acreage between the two bureaus in 1899 had been several hundred thousand acres in excess of the addition of 418,000 acres thus made, and the application of percentages in the usual way for the intervening period, would not much, if at all, decrease the difference. In other words, the Department of Agriculture again refused to accept the reports of the census in a subject where even a relatively slight variation was a matter of the utmost consequence.[1]

[1] In June, 1902, the Department of Agriculture issued a formal report estimating the total acreage planted in cotton in 1902 as 27,878,000 acres, but failed to give the estimated acreage for each state. The absence of such detailed estimates in June or since then have caused comment. On p. 3 of the printed report of June, 1902, is a table of statistics in reference to grain and cotton crops of previous years, headed, "Crop Statistics Compiled from Previous Reports for Comparison with Report for June 1." Under "Cotton" in this table is a column headed "Area Harvested in Year 1901–2," in which the acreage is given for each state and territory, making a total for the country of 27,878,000 acres. The table gives the estimated condition of the crops of cotton, wheat, oats, barley, etc., of each state, on June 1, of 1900 and 1901, but contains no reference whatever to the condition or acreage of grain or other

The other point already once mentioned—the dissatisfaction with the reports of condition—shows clearly enough that even where the department has succeeded by the use of commercial statistics in correcting its figures for acreage and production to a moderately satisfactory extent, it still has trouble in getting from its system of correspondents—the system by which it is most characteristically known—reports of condition. How extensive would be the errors in its cotton returns, were it to depend upon its own resources of information, may be easily explained.

crops for 1902. The text of the report "estimates the total area planted in cotton at about three-tenths of 1 per cent. less than the acreage planted last year," and adds that "adjustments have been made to bring the department's estimates into reasonable conformity with the report of the census, the net result being an addition of about 418,000 acres to the estimate of the area planted last year. This addition raises the estimate of the area planted for 1902–3 to about 27,878,000 acres, or 72,000 acres less than the revised area for last year."

The department's *revised* estimates of the acreage for the crop planted in 1901 was 27,532,000 acres for the entire country. Adding 418,000 to bring it into "reasonable conformity" with the census gives 27,950,000 as the total cotton acreage in 1901.

The official report of the census office giving the acreage of each county, as ascertained by its local enumerators (who are paid for their services), made the total acreage planted in cotton in 1899 amount to 24,275,101 acres. The *revised* estimate by the department issued in December, 1899, made the total acreage of that same year 23,521,000 acres. The *revised* estimate was doubtless made with some care, inasmuch as it added 2,695,000 acres to the department's previous estimate in June of that year; and yet these figures are 754,000 less than those of the census.

Why the department added only 418,000 to its total acreage instead of 754,000, in its laudable desire to get into "reasonable conformity" with the Census Office, is one of those things on which it is idle to speculate. No explanation is given.

The price of cotton is largely influenced by the actual and anticipated supply. Information respecting the acreage planted is useful to farmers, spinners, and dealers to enable them to form intelligent conclusions regarding the probable yield under given conditions of temperature, rainfall, and cultivation. The acreage is the starting-point in all calculations respecting the yield, and it is therefore important that estimates regarding it should be correctly given *during the time the crop is growing*. After a crop has been grown and marketed, the matter of the acreage ceases to be of practical value and becomes merely an academic question in which busy merchants, spinners, and farmers take but little interest. The large corrections made by the department show its conviction that its previous reports were grossly inaccurate, and the official figures of the Census Office prove, not only that the department's additions to its former estimates were justified, but that they were up to 1899 still insufficient by 754,000 acres.—*Cotton Facts*, by ALFRED B. SHEPPERSON, Cotton Exchange Building (New York, 1902), pp. 11, 13.

It is evident that the Agricultural Department has, in the case of cotton, an enormous advantage because of the fact that it can check its annual reports by means of statistics showing the commercial movement of the product. As an observer has recently expressed it:

> No commodity is followed so closely at every step in its progress from the seed-planting to the mill door, as the American cotton crop, and the available supplies of no other crop are known with the accuracy which marks our information regarding cotton. The trade journals and the cotton exchanges expend thousands of dollars annually for information of the movement during each week in the year. Trained statisticians compile and weigh the figures for them. The great railroads are enlisted to return accurate records of shipments and bale weights . . . . . No child grows up at its mother's knee with a watchfulness more assiduous, more ceaseless, more solicitous than marks the growth of every American cotton crop.

If, therefore, the Department of Agriculture is to be judged in an accurate and righteous way, it must be judged, not upon the strength of annual estimates, made up through reliance upon commercial returns, but by those figures which most accurately represent its own peculiar crop-reporting methods. These, as has been said, are the crop reports of condition. If we look at the condition report during the past few years, we shall find that there has been no correspondence whatever between the final crop and the conditions reported. Of course, it is always possible to say that conditions materially change after the reports are given out. But certainly this could not be the case with the final reports as to the condition of cotton. If, for example, the Agricultural Department reported a percentage of 50 the week before harvesting began, and no unusual conditions have intervened, we should say that the department was wrong in its estimates if a normal cotton crop represented by the figure 100 should be gathered in.

Of course, this is only a hypothetical example, and no such close check could ever be obtained upon the condition reports. Yet from any standpoint of general fairness it must appear that the condition percentages reported by the department have been far out of the range of probability. This has eminently been the case during the past two or three years, in spite of the

extravagant claims made by the apologists of the department. During the past ten years the condition report for September has been about 68.7 per cent. of a normal crop, a figure which would correspond roughly to a "normal" of some 15 or 16 million bales, as judged by the actual crops reported at the end of the year. How shall the Agricultural Department explain this discrepancy? One means of doing so has been by a metaphysical interpretation of the word "normal." The ordinary mind conceives of a "normal" crop as an average, or usual, or fair, or ordinary, or satisfactory, crop; the Agricultural Department does none of these things, for in the recent report it has described a normal crop as one "possessing all the elements of perfectness." If that be true and the real normal, according to the Agricultural Department's figures, is 15 or 16 million bales, then we are reduced to the startling conclusion that there has never been a normal crop, since no cotton crop has ever come anywhere near 15 million bales. In other words, by agricultural reasoning, the normal becomes abnormal and the abnormal normal.

Even if we should take the department at its word, however, and, granting it the privilege of a metaphysical definition of normality, should proceed upon the basis thus laid down, difficulties would still appear. The Agricultural Department reported for September, 1902, a cotton-crop condition percentage of about 58. Comparing this with the condition percentage reported at the same time a year ago, and establishing the actual crop of 1901–2 as the crop corresponding to the condition percentage thus reported, it would turn out that the report of the department for September, 1902, indicates a probable crop for 1902–3 of under 9 million bales. As against this, the most reliable commercial estimates have placed the cotton crop to be ginned in 1902–3 at anywhere from 10 million to 11.5 million bales, usually about 10,500,000 bales. But there is still another way of checking the figures of the Agricultural Department. As has already been mentioned in an earlier part of this discussion, the division of manufactures in the Census Bureau was vested by the permanent Census Act, passed in the spring of 1902, with authority to take a census of cotton-ginning. This work was begun in the

autumn of 1902. The plan by which it was carried out included a system of three reports at different intervals during the cotton-ginning season and provided for a visit to every cotton ginnery in the United States by a special paid agent of the Bureau. Upon such returns absolute reliance must be placed. Early in November, 1902, the first of this series of reports was published, and with it came a set of percentages based upon data furnished by the special agents. These percentages expressed the proportion of the total crop supposed to have already been ginned. They were computed by a special method from the returns furnished by the agents, and did not represent a mere general average of the percentage figures returned by these men. The returns thus furnished were as follows:

States and Territories.	Cotton Ginned up to and including October 18 (commercial bales).	Active Ginneries Reporting (Number).	Est. Percentage of Total Crop Ginned to October 18.
Alabama	585,783	3,854	65.0
Arkansas	360,800	2,405	45.2
Florida	29,779	284	57.7
Georgia	906,949	4,891	71.8
Indian Territory	201,019	427	52.3
Kentucky	284	3	40.0
Louisiana	399,408	2,098	43.2
Mississippi	559,126	4,083	44.7
Missouri	14,963	57	49.0
North Carolina	303,029	2,560	60.3
Oklahoma	84,699	210	40.0
South Carolina	601,431	3,082	72.8
Tennessee	121,180	752	50.2
Texas	1,781,797	4,509	70.4
Virginia	5,625	99	49.0
United States	5,925,872	29,314	60.1

From these figures it will appear that the total crop properly to be expected by the country for 1902 would not be less than 10 million bales — a report strikingly at variance with the abnormally low figures of the Agricultural Department. It needs only to be added that the estimates of the department throughout the year 1902, as regards cotton, have been universally discredited

among commercial men familiar with the movement of the staple. Thus it seems that, applying fair and rigid standards even to that article in which the Agricultural Department has boasted of accuracy in cotton reporting, its statistics turn out to raise as many questions as in other lines.

What has the department to say with reference to this terrible record? How has it explained its variation from the census figures? It could do so only by countervailing charges intended to discredit the efficiency of the census, and to make it appear that the returns of that bureau were as worthless as its own figures were popularly reputed to be. In the interest of absolute fairness, it is therefore necessary to review and weigh with care the charges unofficially made by the friends of the Agricultural Department against the census, in order to see how much weight must be assigned to the complaints of inefficiency and inaccuracy urged against the bureau. A discussion of these complaints and the history of the investigation by which it was sought to test the relative accuracy of our two sets of agricultural statistics will form the subject of another paper.

H. PARKER WILLIS.

WASHINGTON, D. C.